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Date: December 26, 2006
Response to Office Action dated September 25, 2006

REMARKS

In the Office Action dated September 25, 2006, the Examiner rejects claims 1-4, 12, 15 and 16 under 35 U.S.C. § 101. The Examiner rejects claims 1-4 and 16 under 35 U.S.C. § 102(e) and claims 5-6 and 9-10 under 35 U.S.C. § 102(b). The Examiner rejects claims 7-8 and 11-15 under 35 U.S.C. § 103(a). With this Amendment, claim 1 is amended. No claims are added or canceled. After entry of this Amendment, claims 1-16 are pending in the Application. Reconsideration of the Application as amended is respectfully requested.

The Examiner rejects claims 1-4, 12, 15 and 16 under 35 U.S.C. § 101, stating that the claimed invention is directed to non-statutory subject matter. The Examiner argues that merely determining a nominal illumination angle does not appear to be sufficient to constitute a tangible result since the outcome of the determining step has not been used in a disclosed application nor been made available in such a manner that its usefulness in a disclosed practical application can be realized. It is respectfully submitted that, as stated in claim 1, once the nominal illumination angle is determined it is used to position a light source at an angle complementary to the determined angle, making a practical example of the use of the nominal illumination angle. As such, the invention is clearly directed to statutory subject matter. Applicants have, however, amended claim 1 to include the additional feature of illuminating the object using the light source, which was previously implied but not stated in the claim. Applicants respectfully request withdrawal of the Examiner's rejection of claim 1 and its dependent claims as being directed to non-statutory subject matter.

The Examiner rejects independent claim 1 and its dependent claims 2-4 and 16 under 35 U.S.C. § 102(e) as being anticipated by Dana (US 2002/0080357). The Examiner states that Dana teaches the features of these claims including the features of independent claim 1 of determining a nominal illumination angle (a bidirectional reflectance distribution function) for the object and positioning a light source at an angle complementary to the nominal illumination angle of the object. This rejection is

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respectfully traversed. As mentioned previously, a nominal illumination angle is defined as the angle of illumination, measured from a plane normal to the object in the illustrated embodiments, which most effectively illuminates the object under consideration. (See paragraph [0021]). The calculation of a bidirectional reflectance distribution function (BRDF) does not teach or suggest determining such a nominal illumination angle. As explained by the Applicants here, and by Dana, the BRDF generally describes the reflectance of various points of a surface based on the angles of illumination and the angles of viewing. (Dana, [0003]). Dana discloses illuminating different areas of a sample 60 at different angles of incidence and detecting the angular variation of radiation emitted from the sample in response to the illumination. (Dana, Abstract). In other words, Dana calculates the intensity of emitted radiation for a test point of a sample 60 for a single angle of incidence, and optionally measures the intensity again for a different angle of incidence of illumination and/or measures additional test points. (Dana, [0059]-[0060]). No nominal illumination angle is determined. In addition, Dana does not teach or suggest positioning a light source at an angle complementary to the nominal illumination angle of the object. Instead, the light source 20 is fixed in position, and the rays are focused on a single focal point 22 through the use of paraboloidal reflector 50. The focal point 22 is located on the surface 14 of the sample 60 to provide a test point 12. The source 20 provides a collimated beam 24 having a path parallel to the optical axis 16 of the paraboloidal reflector 50. Since Dana fails to teach or suggest all of the features of claim 1 and its dependent claims, it is respectfully submitted that the invention of claim 1 and its dependent claims 2-4 and 16 is patentable over the prior art of record.

Claims 12 and 15 depend from claim 1. The Examiner rejects claims 12 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Dana. With respect to claim 12, the Examiner states that Dana discloses the claimed invention except for positioning the detecting lens arrangement along a line perpendicular to a surface of the object. The Examiner states, however, that this is a well-known feature that directs the input light

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beam to the detector, which decreases the amount of light loss to the detector. It is respectfully submitted that the Examiner has failed to make a *prima facie* case of obviousness. The inquiry for obviousness revolves around whether one skilled in the art at the time the invention was made would be motivated to make the combination. Even if this were a well-known feature, and even if the purported benefit of a decrease in the light loss to the detector were a known benefit, such a combination would still not be obvious to one skilled in the art. Dana uses a paraboloidal reflector 50 to focus the collimated beam 24 having a path parallel to its optical axis 16 on a test point 12 and to focus the emitted radiation 34 to the detector 90. Placement of a detecting lens arrangement would be either ineffective if arranged outside the paraboloidal reflector 50 since it would receive no emitted light or would render the device of Dana inoperative if arranged inside the paraboloidal reflector 50 since it would interfere with the angles of reflection of the light beams by the paraboloidal reflector 50. In neither case would one skilled in the art be motivated to make the combination suggested by the Examiner.

Claim 12 is allowable over the prior art of record.

With respect to claim 15, the Examiner states that Dana positioning the light source at the angle complementary to the nominal illumination angle of the object but states that it would have been obvious to use plural discrete light devices since it is well known in the art that using a plurality of light devices increases illumination coverage of the lighting device to increase sensitivity of the measurement. It is respectfully submitted that the Examiner has misstated the feature of claim 15. Claim 15 requires positioning each of the plurality of discrete light devices at the angle complementary to the nominal illumination angle. For the reasons stated with respect to claim 1, Dana fails to teach or suggest this feature. Claim 15 is allowable over the prior art of record.

The Examiner rejects independent claim 5 and its dependent claim 6 under 35 U.S.C. § 102(b) as being anticipated by Takagi et al. (US 5,166,985). The Examiner states that Takagi et al. discloses a plurality of discrete light sources arranged

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in two dimensions and positioned at an angle complementary to the nominal illumination angle. The Examiner takes the position that every object illuminated has a nontrivial bi-directional reflectance distribution function and that the reference to Takagi et al, positions the light sources at that nominal illumination angle so as to receive accurate detection signals. The Examiner concludes that, as a result, Takagi et al. reads on the claimed invention.

This rejection is respectfully traversed. First, the position of the Examiner that every object illuminated has a nontrivial bi-directional reflectance distribution function is belied by Applicants' disclosure, where objects without a nontrivial bi-directional reflectance distribution function are disclosed as being substantially diffuse reflecting Lambertian objects and substantially specular reflecting objects. Aside from this, as the Examiner did in the rejections of claim 1 and its dependent claims above based on Dana, the Examiner appears to be equating the calculation of a bi-directional reflectance distribution function with the determination of a nominal illumination angle. As mentioned above, a nominal illumination angle is defined as the angle of illumination, measured from a plane normal to the object in the illustrated embodiments, which most effectively illuminates the object under consideration. (See paragraph [0021]). Applicants also dispute the Examiner's implication that receiving accurate detection signals is sufficient motivation to position the light sources at the angle complementary to the nominal illumination angle.

Applicants respectfully submit that Takagi et al. neither teaches nor suggests the feature of claim 5 and its dependent claims of a plurality of discrete light sources arranged in two dimensions and positioned at an angle complementary to the nominal illumination angle. Takagi et al. generally teaches illuminating the surface of an object using a first set of ring lights and illuminating the surface of the object using a second set of ring lights arranged at a different height from the first set of ring lights. The brightness values of the first and second images acquired under these differing lighting conditions are divided pixel-by-pixel to form a third image used for quality

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evaluation of the surface shape and pattern. (Takagi et al., Abstract). Additional ring lights can be used, such as those shown in Fig. 12. Contrary to the Examiner's assertion, the ring lights do not teach or suggest a plurality of discrete light sources arranged in two dimensions and positioned at an angle complementary to the nominal illumination angle. Each ring light 3, 4 does include a plurality of discrete light sources 34, 35, 36. (Takagi et al., Fig. 10). The ring lights 3, 4 (and 51-54) are arranged coaxially with respect to a line between the camera 5 and the object 10. (Takagi et al., col. 3, ll. 57-60; col. 9, ll. 9-12). However, the plurality of discrete light sources is not positioned at an angle complementary to the nominal illumination angle. In fact, the plurality of discrete light sources for a single ring light 3, 4 is arranged perpendicular to the surface of the object, not at an angle complementary to the nominal illumination angle. In combination, two or more rings also include a plurality of discrete light sources. Again, these light sources are arranged perpendicular to the surface of the object.

The Examiner points to Figure 12 of Takagi et al. for this element. It is clear, however, that Figure 12 does not illustrate a situation where the plurality of discrete light sources is arranged at an angle complementary to the nominal illumination angle. Instead, Figure 12 merely illustrates that the inclinations formed by the lights 51 to 54 and the object are denoted by α_1 , α_2 , α_3 and α_4 . These do not represent the angle at which the plurality of discrete light sources is arranged. Further, even if α_1 , α_2 , α_3 and α_4 did represent the angle at which each of the plurality of discrete light sources for a respective light ring 51 to 54 was arranged, the plurality would not be arranged an angle complementary to the nominal illumination angle, which can only be one angle by definition. Instead, the sources would be arranged at four different angles.

For the foregoing reasons, claim 5 and its dependent claim 6 are allowable over the prior art of record.

Claims 7-8 and 13 depend directly and indirectly from claim 5. The Examiner rejects claims 7-8 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Takagi et al. in view of Luk (US 2002/0181231 A1). The Examiner states that Takagi et

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al. teaches the features of claim 5. The Examiner cites Luk for the additional teachings of each of claims 7, 8 and 13. With respect to claim 7, the Examiner states that it would have been obvious to include the cone shaped LEDs of Luk in Takagi et al. for the purpose of providing an illumination device that provides proper illumination of different size objects to increase the accuracy of the measurements. With respect to claim 8, the Examiner states that it would have been obvious to include the LEDs on two rigid circuit boards of Luk in Takagi et al. for the purpose of providing a secure and stable platform for mounting LEDs, which decreases the amount of maintenance needed in operating the LEDs. With respect to claim 13, the Examiner states that it would have been obvious to include the features therein, which are purportedly taught in Luk, in Takagi et al. for the purpose of providing an illumination device that covers multiple illumination angles, therefore providing proper illumination of different size objects that increases the accuracy of the measurements. These rejections are respectfully traversed.

As an initial matter, it is respectfully submitted that Luk is not prior art to the claimed invention that can be used in combination with Takagi et al. in an effort to render the claimed invention obvious. Whether a reference is prior art to an invention depends on whether one skilled in the art would have access to the reference. This depends in part as to whether the cited reference is in the field of interest of the inventor. The diode lighting system of Luk is in the field of large scale lighting arts for use in viewing, for example, a stage by an audience and is included in class 362, which is generally directed to illumination not otherwise classified. (Luk, [0010] and [0029]). In contrast, Takagi et al. is directed to the automated analysis of an image or recognition of a pattern in class 382. One skilled in the art of image analysis or pattern recognition would not look to the field of Luk. Further, Luk does not address any problem identified in the prior art of Takagi et al. Hence, one skilled in the art would have no cause to be aware of Luk.

Further, even if Luk were prior art that could be used in an obviousness rejection of the claimed invention, it is respectfully submitted that motivation for the

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combination is still required. The Examiner's motivation is the purported improvement to accuracy and/or stability. Stability is not a problem identified in the prior art, nor is there any suggestion greater accuracy or stability would result from the Examiner's combinations. It is respectfully submitted that the Examiner's purported motivations for the suggested combinations comprise impermissible hindsight that takes the invention and seeks missing elements in the art without regard for what one skilled in the art would consider to be obvious.

Nonetheless, Applicants submit that, even if the combinations were permissible and suggested, they would fail to teach or suggest all the features of claim 5, from which each claim depends. Like Takagi et al., Luk fails to teach or suggest that the plurality of discrete light sources not positioned at an angle complementary to the nominal illumination angle. Luk discloses a theatrical lighting system. In Luk, the object to be illuminated is, for example, a screen 98. Luk defines a focal point, or target zone, 346 to organize the intensity and direction for the discrete light beams generated by diodes 322A-322F. (Luk, [0176]). Once the target zone 346 is defined, each of the diodes 322A-322F is positioned in graduated mounting steps 312. (Luk, [00177]). Hence, each of the diodes 322A-322F are positioned at multiple angles related to their step position and the cone geometry, not at a single angle complementary to the nominal illumination angle. Since neither of the references teaches or suggests the features of claim 5, the combination does not teach or suggest the features of claim 5 and its dependent claims 6-8 and 13.

The Examiner rejects claim independent claim 9 and its dependent claim 10 under 35 U.S.C. § 102(b) as being anticipated by Takagi et al. (US 5,166,985). This rejection is respectfully traversed. As the Examiner knows, claim 9 and its dependent claims are written in Jepson form. A claim in Jepson form includes the device and recited features of the preamble together with the improvement noted in the body of the claim. It is respectfully submitted that claim 9 includes a device for inspecting semiconductor devices having a nontrivial bi-directional reflectance distribution

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function. The device includes a sensing element, a lens arrangement and a two dimensional light source positioned at an angle complementary to a nominal illumination angle of a semiconductor device. For the reasons stated with respect to claim 5, Takagi et al. fails to teach or suggest the feature of claim 9 and its dependent claim 10 of a two dimensional light source positioned at an angle complementary to a nominal illumination angle of a semiconductor device.

Claim 11 depends from claim 10 and includes the feature wherein the collection of LEDs is arranged as a cone. The Examiner rejects claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Takagi et al. in view of Luk based on the reasoning rejecting claim 7. For the reasons stated with respect to claims 7-8 and 13, the combination of Takagi et al. and Luk, even if permissible or suggested, fails to teach the features of claim 11.

Claim 14 depends from claim 9 and includes the feature wherein the lens arrangement is positioned symmetrically about a line perpendicular to a surface of the semiconductor device. The Examiner rejects claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Takagi et al. Applicants respectfully submit that claim 14 is allowable based on its dependency from claim 9, which is allowable as discussed above.

It is respectfully submitted that this Amendment traverses and overcomes all of the Examiner's objections and rejections to the Application as originally filed. It is further submitted that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the Application. Reconsideration of the Application as amended is requested. It is respectfully submitted that this Amendment places the Application in suitable condition for allowance; notice of which is requested.

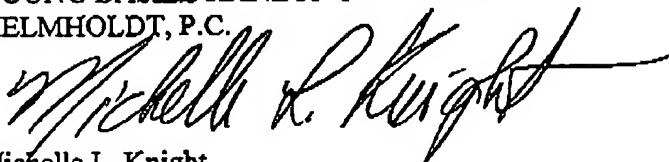
If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact Applicants' attorney at the telephone number listed below.

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Respectfully submitted,

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